

## Patent Abstracts of Japan

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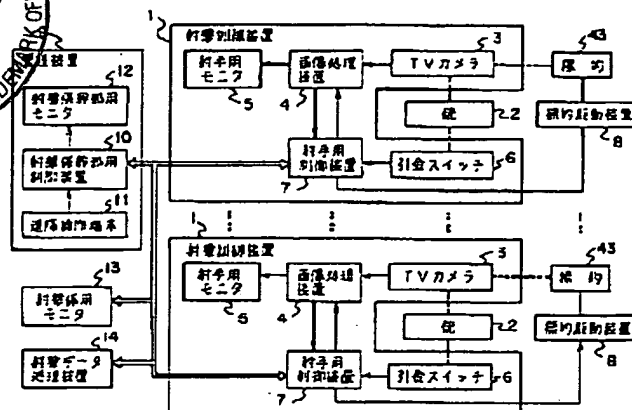
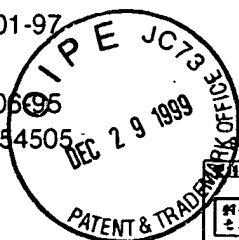
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TITLE : SHOOTING TRAINING DEVICE AND  
 SHOOTING TRAINING SYSTEM



ABSTRACT : PURPOSE: To provide a shooting training device in which a guidance about a sighting method can be carried out when a shooter takes a gun to set a shooting line against the target and a virtual shooting not shooting an actual bullet can be replaced with the actual shooting.

CONSTITUTION: This system comprises a TV camera 3 fixed to a gun 2 while an axis of a lens being directed substantially in parallel with a gun body and a direction of the lens and a direction of extending line of an opening of the gun body being aligned to each other and a monitor 5 for a shooter for displaying its image. In addition, this system comprises a trigger switch 6 for sensing that a gun trigger is pulled, an image memory for storing an image of the camera at the time of pulling the trigger in response to a signal obtained from the trigger switch 6 and an acknowledging device operated to assume a central point of the image stored in the image memory as a point of impact and defining a displacement between the point of impact and a target 43 imaged within the image.

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**CLAIMS**

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[Claim(s)]

[Claim 1] Shooting training equipment equipped with the monitor for gunners which displays the image photoed in the axis of a lens by the TV camera fixed to the gun in accordance with the sense of a lens, and the direction of a production of opening of a barrel almost in parallel with a barrel, and said TV camera.

[Claim 2] Shooting training equipment which makes the central point of said image the point of aim of a gun, and is characterized by displaying the graphic form which shows the point of aim of said gun to the screen of said monitor in shooting training equipment according to claim 1.

[Claim 3] The TV camera fixed to the gun in accordance with the sense of a lens, and the direction of a production of opening of a barrel almost in parallel with a barrel in the axis of a lens, The monitor for gunners which displays the image photoed by said TV camera, The trigger switch which detects that the trigger of a gun was subtracted, and the image memory which memorizes the image of the camera in the time of a trigger being subtracted based on the signal from said trigger switch, Shooting training equipment equipped with the recognition equipment which considers that the central point of the image memorized in said image memory is an impact area, and deduces the gap with said impact area and target currently photoed in this image.

[Claim 4] Shooting training equipment characterized by what the score of the shooting is calculated in shooting training equipment according to claim 3 based on the location gap with the impact area and target by which rate appearance was done [ above-mentioned ], and is displayed on said monitor for gunners.

[Claim 5] It is the shooting training system which it has management equipment which connected two or more shooting training equipments according to claim 3, and said management equipment totals the shooting data which consist of a location of said impact area received from said two or more shooting training equipments, or a score, and displays a total result on an administrative monitor according to a list or an individual.

[Claim 6] It is the shooting training system characterized by controlling two or more label-destruction with which said management equipment comes to have a remote-operation means in a shooting training system according to claim 5, and it corresponds to said two or more shooting training equipments with said remote-operation means, respectively, and appearance.

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**DETAILED DESCRIPTION**

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**[Detailed Description of the Invention]**

[0001]

[Industrial Application] This invention relates to shooting training equipment and a shooting training system.

[0002]

[Description of the Prior Art] Shooting training by the conventional small arms is performed in the launch complex 40 as shown in drawing 11 using the live cartridge. There is it along launch complex 40 in the travelling direction of a projectile, there are 1 or two or more lanes 41, and there is \*\*\*\*\* 42 in the termination of the travelling direction. Before \*\*\*\*\* 42, as shown in drawing, the target 43 is attached for every lane. A launcher 44 is in the location it was [ the location ] 300m away from \*\*\*\*\* 42 200m 100m in the direction of this side of a lane 41, respectively. Shooting training is performed because a gunner shoots at a target 43 from these launchers 44.

[0003] Moreover, in performing shooting training by the live cartridge in the above launch complex, only a target is photoed with each TV camera installed by corresponding in label, comparison collating is carried out the image shooting-front and after shooting, and the technique of performing automatic reading and grading of a hit bullet mark is indicated by JP,5-196435,A by detecting the location of a bullet mark.

[0004]

[Problem(s) to be Solved by the Invention] In shooting training by the above-mentioned conventional small arms, shooting instruction is made by seeing the bullet mark on a target etc. However, these are made after shooting to the last, and when a gunner establishes a gun, receives in label and has defined the aim, they cannot be performed.

[0005] Moreover, since shooting training by the above-mentioned conventional small arms is live shooting, cures against a \*\* member, such as a staff for watch, are required for it. Moreover, it is not avoided that an ammunition, a target, etc. exhaust, either.

[0006] The technical problem which this invention tends to solve is to enable it to carry out, when a gunner establishes a gun, instruction about how to define collimation is received in label and the aim is defined.

[0007] Moreover, other technical problems which this invention tends to solve are to substitute for a shooting action simulation shooting with which a live cartridge is not shot.

[0008]

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, the shooting training equipment of this invention shall be equipped with the monitor for gunners which displays the image photoed in the axis of a lens by the TV camera fixed to the gun in accordance with the sense of a lens, and the direction of a production of opening of a barrel almost in parallel with a barrel, and this TV camera.

[0009] In this case, it is desirable to display the graphic form which makes the central point of an image the point of aim of a gun, and shows the point of aim of a gun to the screen of the monitor for gunners. The graphic form has a good intersection also as a cross which shows the point of aim of a gun.

[0010] In order to solve other above-mentioned technical problems, for the above-mentioned means Moreover, in addition, the trigger switch which detects that the trigger of a gun was subtracted, The recognition equipment which deduces the gap with an impact area and the target currently photoed in this image shall be formed by considering that the central point of the image memorized in the image memory which memorizes the image of the camera in the time of a trigger being subtracted based on the signal from a trigger switch, and the image memory is an impact area.

[0011] In this case, it is desirable to calculate the score of that shooting based on the location gap with the impact area and target by which rate appearance was done [ above-mentioned ], and to display on the monitor for gunners.

[0012] Moreover, the shooting training system of this invention is equipped with the management equipment which connected two or more above shooting training equipments, and management equipment shall total the shooting data which consist of a location of the impact area received from two or more shooting training equipments, or a score, and shall display a total result on an administrative monitor according to a list or an individual.

[0013] In this case, it is desirable to control two or more label-destruction with which a remote-operation means is formed in management equipment, and it corresponds to two or more shooting training equipments with that remote-operation means, respectively, and appearance.

[0014]

[Function] According to the above-mentioned solution means, the technical problem which should solve this invention is solvable with the next operation. Namely, as for the image acquired by the TV camera fixed in parallel with a gun, all the points on the production of a barrel are located at the core of an image. Here, if a ballistic trajectory simulates with a match on the production of a barrel, by the location gap with the central point of a display image, and the target in an image, collimation can set and the propriety of the direction can be known immediately. Therefore, by seeing the monitor for gunners, while [ that ] the gunner is aiming at the target, a shooting leader can check the point of aim and target on a screen, and can perform suitable instruction.

[0015] Moreover, if graphic forms, such as a cross joint which shows the central point (point of aim) of an image, are piled up and displayed on monitor display in addition to this, a shooting leader can identify the gap with the point of aim and a target more clearly.

[0016] Moreover, in addition to the above, other technical problems which should solve this invention are solvable with the next operation. That is, the image of the moment of pulling the trigger detected with a trigger switch is fixed to an image memory. Here, if the central point of the image is simulated with an impact area on a target, an impact area is immediately illustratable on the target of monitor display by searching for a position coordinate from the gap with this and the label hit alignment in an image. Therefore, a shooting action can be simulated by these actuation of a series of, without shooting a live cartridge. Moreover, grading of the simulation shooting is automatable by computing the score of impact according to the scorebook which was able to be defined beforehand to coincidence.

[0017] Moreover, since shooting staff management can carry out monitoring of each gunner's shooting training result according to a list or an individual by using two or more above-mentioned shooting training equipments by two or more gunners, collecting the data of the training result, and carrying out a screen display with a monitor, it can be used for shooting training in a unit unit.

[0018] Moreover, in addition to the above-mentioned configuration, shooting staff management can command shooting training in the place distant from the gunner by having enabled it to operate each label-appearance and destruction by remote control.

[0019]

[Example] The block diagram about [ whole ] one example of the shooting training system which applied the shooting training equipment of this invention to drawing 1 is shown. This example consists of two or more sets of shooting training equipments, and 1 set of management equipments.

[0020] The shooting training equipment 1 of this example is constituted by the trigger switch 6 fixed to TV camera 3 fixed to the gun 2, the image processing system 4, the monitor 5 for gunners, and the gun 2, the control unit 7 for gunners, and the target driving gear 8 which appears and destroys a target 43. The image from TV camera 3 is displayed on the monitor 5 for gunners through an image processing system 4. Moreover, at the moment of shooting detected by the trigger switch 6, it is told to an image processing system 4 through the control unit 7 for gunners, it considers that the point of aim within the instantaneous camera image is an impact area, and grading processing is made. As for above shooting training equipment 1, a lane is arranged by the number at the maximum for every lane in 1 set and the whole launch complex.

[0021] The remote-operation terminal 11 and the monitor 12 for shooting staff management are connected to the control unit 10 for shooting staff management, respectively, and the management equipment 9 of this example is constituted. The control unit 10 for shooting staff management also controls each target driving gear 8 connected to this according to a package or an individual while controlling each control unit 7 for gunners. Moreover, the remote-operation terminal 11 is used in order to carry out the setting input of the various conditions of each control unit 7 for gunners, or to operate each target driving gear 8 by remote control and to appear and destroy a target 43. Each gunner's shooting training result is displayed on the monitor 12 for shooting staff management according to a list or an individual. Above management equipment 9 is arranged only 1 set in the whole launch complex, and the control unit 10 for shooting staff management of management equipment 9 and the control unit 7 for gunners of each shooting training equipment 1 constitute the shooting training system from connecting mutually through a LAN circuit.

[0022] Moreover, storage, printing, and the shooting data processor 14 that carries out image display may be added for the monitor 13 for shooting staffs which displays a gunner's shooting training result according to a list or an individual like the monitor 12 for shooting staff management as this shooting training structure of a system, each gunner's shooting training result, etc. In drawing 1, although the monitor 13 for shooting staffs serves as connection only whose one set went via the LAN circuit, it is good for the control unit 10 for shooting staff management also as direct connection connection like the monitor 12 for shooting staff management. Moreover, two or more monitors 13 for

shooting staffs may be connected.

[0023] The example block diagram of an image processing system 4 and the control unit 7 for gunners which is the important section of the shooting training equipment 1 of this example is shown in drawing 2. An image processing system 4 consists of a switcher 15, the display process circuit 16, video 17, an image memory 18, and recognition equipment 19, and the control device 7 for gunners consists of the impact-area memory 20, the actuation switch 21, an interface circuitry 22, an I/O circuit 23, and a control circuit 24 that controls above-mentioned each part.

[0024] The video signal from TV camera 3 is inputted into a switcher 15. With directions of a control circuit 24, a switcher 15 chooses the signal path to the display process circuit 16, video 17, and an image memory 18. In addition, with alternative, this routing may not be restricted but may choose two or more things as coincidence.

[0025] With directions of a control circuit 24, the display-processing circuit 16 processes the video signal of real time soon inputted from a switcher 15. Moreover, with reference to coincidence, the contents of the impact-area memory 20 also carry out image composition at a multi-window format, and output these to the monitor 5 for gunners. Moreover, the video signal from video 17 may be processed and it may output to the monitor 5 for gunners.

[0026] With directions of a control circuit 24, video 17 is recorded through the video signal inputted from a switcher 15, or reproduces a video signal from a medium, and outputs it to the display-processing circuit 16.

[0027] An image memory 18 memorizes the video signal for one screen inputted from a switcher 15 as a static image following directions of a control circuit 24. With directions of a control circuit 24, recognition equipment 19 recognizes the label-image reflected in the image from the contents fixed to the image memory 18, and detects the difference of the location of the label-central point and central point of an image. And the position coordinate of an impact area is computed, it asks for the score of the impact according to the scorebook which was able to be defined beforehand, and these are accumulated in the impact-area memory 20. The contents of the impact-area memory 20 are referred to from the display-processing circuit 16 or the I/O circuit 23.

[0028] Mainly at the time of use with a shooting training equipment simple substance, the actuation switch 21 is used in order to input choose distance, target size, etc., or to shoot, to drive the target driving gear 8 and to appear and destroy a target 43, a gunner name. Moreover, it is used also for actuation of the image transcription of video 17, or playback. And the interface circuitry 22 took charge of the input interface of the actuation switch 21 and the trigger switch 6, and has told the signal from these input units to the control circuit 24. The moment of shooting is detected, and a control circuit 24 controls a switcher 15 by the trigger switch 6, and makes an image memory 18 memorize the image from TV camera 3 with it at the moment of the signal which shows it being told to a control circuit 24 through an interface circuitry 22. It is as having described previously a series of actuation of each part, such as the image memory 18 after this, recognition equipment 19, and the impact-area memory 20.

[0029] The I/O circuit 23 has an interface for LAN circuits. The control device 7 for gunners can communicate with the control device 10 for shooting staff management, or the shooting data processor 14 from connecting with a LAN circuit using this. Based on directions of a control circuit 24, the I/O circuit 23 receives the gunner data from the control signal, the control signal to the target driving gear 8, or the shooting data processor 14 to the control unit 7 for gunners from the control unit 10 for shooting staff management etc., and is \*\*\*\*\* to a control circuit 24 about these.

Moreover, information, such as positional information of an impact area and a score, is acquired from the impact-area memory 20, and it transmits to the control device 10 for shooting staff management, or the shooting data processor 14 by making these into shooting data. In addition, transmission and reception of data with the shooting data processor 14 are not direct, and can also be performed via the control unit 10 for shooting staff management. Furthermore, the I/O circuit 23 has a RS232C interface. The control unit 7 for gunners can connect the target driving gear 8 using this, and a target's 43 appearance and motion control of destruction can be performed by sending a control signal to this.

[0030] The example block diagram of the control unit 10 for shooting staff management which is the important section of management equipment 9 is shown in drawing 3. The control device 10 for shooting staff management consists of the actuation switch 25, an interface circuitry 26, the I/O circuit 27, a display-processing circuit 28, and a control circuit 29. A control circuit 29 is controlling the timing of transmission and reception using the I/O circuit 27, and is also performing control of this whole system to each control unit 7 for gunners, each target driving gear 8 connected to them, and a pan while it controls above-mentioned each part in the control unit 10 for shooting staff management, respectively.

[0031] The actuation switch 25 is used in order to change the contents of a display of the monitor 12 for shooting staff management. And the interface circuitry 26 took charge of the input interface of the actuation switch 25 and the remote-operation terminal 11, and has told the signal from these input units to the control circuit 29.

[0032] The I/O circuit 27 has an interface for LAN circuits. By connecting with a LAN circuit using this, the control device 10 for shooting staff management can communicate with the control device 7 for gunners, or the shooting data processor 14. The I/O circuit 27 transmits the control signal to each control unit 7 for gunners, the control signal to the target driving gear 8 connected to these, etc. based on directions of a control circuit 29. Moreover, shooting data etc.

are received from each control device 7 for gunners. Similarly, Hazama with the shooting data processor 14 also transmits and receives data.

[0033] The display-processing circuit 28 changes into a picture signal each gunner's gunner data received via the I/O circuit 27, shooting data, etc., and they carry out a display output according to an individual for each [ a list or ] gunner of every to the monitor 12 for shooting staff management with directions of a control circuit 29.

[0034] The example block diagram of the shooting data processor 14 is shown in drawing 4 . The shooting data processor 14 consists of a keyboard 30, a printer 31, an interface circuitry 32, the I/O circuit 33, the display-processing circuit 34, a monitor 35, main storage 36, an auxiliary storage unit 37, and a control circuit 38 that controls above-mentioned each part.

[0035] A keyboard 30 is used in order to input gunner data, such as a gunner name and a unit name, \*\* meeting setting data, etc. Moreover, a printer 31 prints gunner data, shooting data, \*\* meeting setting data, etc. And an interface circuitry 32 takes charge of the input interface from a keyboard 30, and the output interface to a printer 31 with directions of a control circuit 38.

[0036] The I/O circuit 33 has an interface for LAN circuits. The shooting data processor 14 can communicate with the control unit 7 for gunners, or the control unit 10 for shooting staff management from connecting with a LAN circuit using this. The I/O circuit 33 transmits gunner data etc. to each control device 7 for gunners based on directions of a control circuit 38. Similarly, based on directions of a control circuit 29, the shooting data from each control device 7 for gunners etc. are received. Similarly, Hazama with the control device 10 for shooting staff management also transmits and receives data. In addition, transmission and reception of data with each control device 7 for gunners are not direct, and can also be performed via the control device 10 for shooting staff management.

[0037] With directions of a control circuit 38, the display-processing circuit 34 changes into a picture signal each gunner's gunner data received via the I/O circuit 33, shooting data, etc., and outputs them to a monitor 35.

[0038] Main storage 36 stores the information on the shooting data of each control device 7 for gunners received by the information inputted by the keyboard 30 with directions of a control circuit 38, or the I/O circuit 33 etc. Moreover, main storage 36 is backed up by the floppy disk with an auxiliary storage unit 37.

[0039] Next, actuation of this example is explained.

[0040] First, preparations for use are described. In the \*\*\*\*\* 42 neighborhood, as shown in drawing 5 , it shoots to the target driving gear 8 currently installed to the front, and the target 43 according to distance is attached. The target 43 according to each \*\*\*\*\* (100m, 200m, and 300m) is shown in drawing 6 .

[0041] Shooting training equipment 1 is assembled in a launcher 44. That is, a gunner fixes TV camera 3 and the trigger switch 6 to a gun 2 like drawing 7 . And TV camera 3 is connected to an image processing system 4, and the trigger switch 6 is connected to the control unit 7 for gunners, respectively. Moreover, the monitor 5 for gunners is connected to an image processing system 4. Furthermore, the control unit 7 for gunners and the target driving gear 8 in \*\*\*\*\* 42 this side are connected.

[0042] In performing this shooting training as a unit, management equipment 9 is needed. The monitor 12 for shooting staff management and the remote-operation terminal 11 are connected to the control unit 10 for shooting staff management, and management equipment 9 is constituted. And the control unit 10 for shooting staff management and the control unit 7 for gunners of two or more shooting training equipments 1 are connected through a LAN circuit. Moreover, the shooting data processor 14 and the monitor 13 for shooting staffs are also connectable through a LAN circuit similarly. The case where gave especially the following explanation the shooting training system by which in the case of training of the unit unit which uses two or more lanes the configuration of each equipment was also equipped with management equipment 9 unless it refused, and the shooting data processor 14 and the monitor 13 for shooting staffs are further added from this shall be described.

[0043] Next, the remote-operation terminal 11 is operated and it chooses about whether each label-appearance and destruction are performed by \*\* meeting setup, or it carries out manually. In addition, it says setting up beforehand the time amount to the label-appearance determined as a \*\* meeting setup for every number, and destruction. And while transmitting to gunner data, the existence of foot use, and the control unit 7 for the gunners of the lane in which it shoots, distance, the class of gun to be used, etc. are set, and such information of the concerned gunner is and displaying on the applicable part of each monitor 5 for gunners through an image processing system 4 for every gunner, it stores also in the shooting data processor 14 at the delivery main storage 36.

[0044] Moreover, a keyboard 30 can be used also in the shooting data processor 14, gunner data, such as a gunner name and a unit name, \*\* meeting setting data, etc. can be inputted, and these can be registered into main storage 36.

[0045] In addition, the actuation switch 21 of the control device 7 for gunners performs setup about appearance and destruction of the target 43 in the case of performing shooting training in an individual unit not on a unit unit but on an independent lane, and actuation.

[0046] Next, the actuation at the time of use is described. A gunner establishes a gun 2 so that it may come on the

marker of the self-lane where the muzzle was installed in the launcher 44. The image from TV camera 3 fixed to the gun 2 is displayed on the monitor 5 for gunners which exists to a gunner through an image processing system 4. The example of a screen display of the monitor 5 for gunners is shown in drawing 8. A target's 43 image photoed by TV camera 3 with the cross line in which the point of aim of a gun is shown is displayed on the TV camera graphic display section of monitor 5 screen for gunners. A shooting leader performs fine instruction about how to define collimation by pointing out the gap with a gunner's point of aim and a label hit alignment, looking at this. Moreover, the rain number 45 is displayed on the target 43, when a shooting leader checks this with the monitor 5 for gunners, conventionally, it can be careful of it or shooting to the adjoining lane generated frequently can be prevented. The situation of the exchange of a gunner and a shooting leader in the above launcher 44 is shown in drawing 9. In addition, it can also discriminate from a gunner by processing the rain number 45 currently displayed on the target 43 with recognition equipment 19. Moreover, by operating the actuation switch 21, recording the image of TV camera 3 on videotape in video 17 can also be reproduced after this, and it can also carry out a screen display to the monitor 5 for gunners.

[0047] By a command of shooting staff management or appearance of the target 43 which operates the remote-operation terminal 11, a gunner aims at the texture \*\*\*\* target 43, and pulls a trigger. The trigger switch 6 detects the moment and notifies it to the control unit 7 for gunners. The control unit 7 for gunners controls the switcher 15 in an image processing system 4 by the control circuit 24, and makes an image memory 18 memorize the image of TV camera 3 of the moment of pulling a trigger, by it. And it considers that the point of aim of the moment of lengthening the central point of an image, i.e., a trigger, with recognition equipment 19 is an impact area on a target, the coordinate of an impact area is searched for by measuring the gap with this point and the core of the target 43 reflected in the image, and that score is computed. And while storing such information in the impact-area memory 20, an image processing is carried out in the display-processing circuit 16, on the target currently illustrated in the impact position representation section of the monitor 5 for gunners, the position coordinate of the newest impact area is indicated by the mark, and a score and the totaling point of the impact are displayed at the score data display section. The situation is shown in drawing 8.

[0048] Moreover, the positional information of an impact area and the score which were stored in the impact-area memory 20 are transmitted timely through a LAN circuit as shooting data towards the control unit 10 for shooting staff management of management equipment 9 from the I/O circuit 23 with gunner data etc. The control device 10 for shooting staff management which received this changes each gunner's received gunner data, shooting data, etc. into a picture signal by the display-processing circuit 28, and outputs them to the monitor 12 for shooting staff management. Moreover, the same screen as the monitor 12 for shooting staff management is displayed on the monitor 13 for shooting staffs. The example of a display of the screen of the monitor 12 for shooting staff management and the monitor 13 for shooting staffs is shown in drawing 10 R> 0. Thereby, shooting staff management can know each gunner's shooting training result by seeing the monitor 12 for shooting staff management. A list indication of each gunner's score is given for every lane at the score data display section classified by gunner of the monitor 12 for shooting staff management. Moreover, shooting staff management can indicate by the mark and can make the score data display section display the score on the target which has illustrated the location of the gunner's impact area in the impact position representation section of monitor display by operating the actuation switch 25 or the remote-operation terminal 11, and choosing a specific gunner.

[0049] Moreover, suitably, these shooting training results are printed by the printer 31, or a screen display is carried out to a monitor 35 while they are sent also to the shooting data processor 14 and memorized by main storage 36. In addition, the data memorized by main storage 36 are backed up by the floppy disk with an auxiliary storage unit 37.

[0050] When a gunner receives in label and has defined the aim by the above because a shooting leader looks at the monitor 5 for gunners according to this example, instruction about how to define collimation can be performed.

[0051] Moreover, since the shooting action itself can be simulated without discharging a live cartridge, neither an ammunition nor a target needs to exhaust. And the \*\* member for the \*\* member for bullet mark reading and watch becomes unnecessary. Moreover, for the beginner of shooting, it can get used without risk of following on live shooting to the treatment of a gun.

[0052] Moreover, when performing shooting training in a unit unit, instant monitoring of each gunner's shooting training result can be performed by totaling the shooting data sent from two or more shooting training equipments of each with management equipment, and displaying according to a list or an individual with an administrative monitor.

[0053] Moreover, shooting training can be commanded in the place distant from the gunner by making the target of each lane appear and destroy at a remote-operation terminal.

[0054] It describes below about other examples using this invention.

[0055] In the shooting training equipment of this invention, practice of loading of a projectile can be performed by using a blank-shot cartridge at the time of shooting training. Training near live shooting is attained by furthermore experiencing the sound at the time of discharge, and counteraction.

[0056] Moreover, by connecting to the shooting training equipment of this invention the equipment which reads the impact area of live shooting etc., it can shoot at both the aforementioned simulation shooting and live shooting by the same gun, and deflection of the ballistic trajectory by amendment of the parallelism of a barrel and a TV camera or the wind etc. can be amended by detecting the difference of both impact area.

[0057] Furthermore, in the shooting training system of this invention, shooting training more near a battle can be performed by giving other gunners the gun of this configuration and performing simulation shooting mutually.

[0058]

[Effect of the Invention] According to this invention, when a shooting leader looks at a monitor, and a gunner receives in label and has defined the aim, instruction about how to define collimation can be performed.

[0059] Moreover, since the shooting action itself can be simulated without using a live cartridge, there is no generating of an ammunition and which label article of consumption. Moreover, the \*\* member for the \*\* member for target bullet mark reading and watch becomes unnecessary. Moreover, for the beginner of shooting, it can get used without risk of following on live shooting to the treatment of a gun.

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**TECHNICAL FIELD**

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[Industrial Application] This invention relates to shooting training equipment and a shooting training system.

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PRIOR ART

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[Description of the Prior Art] Shooting training by the conventional small arms is performed in the launch complex 40 as shown in drawing 11 using the live cartridge. There is it along launch complex 40 in the travelling direction of a projectile, there are 1 or two or more lanes 41, and there is \*\*\*\*\* 42 in the termination of the travelling direction. Before \*\*\*\*\* 42, as shown in drawing, the target 43 is attached for every lane. A launcher 44 is in the location it was [ the location ] 300m away from \*\*\*\*\* 42 200m 100m in the direction of this side of a lane 41, respectively. Shooting training is performed because a gunner shoots at a target 43 from these launchers 44.

[0003] Moreover, in performing shooting training by the live cartridge in the above launch complex, only a target is photoed with each TV camera installed by corresponding in label, comparison collating is carried out the image shooting-front and after shooting, and the technique of performing automatic reading and grading of a hit bullet mark is indicated by JP,5-196435,A by detecting the location of a bullet mark.

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**EFFECT OF THE INVENTION**

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[Effect of the Invention] According to this invention, when a shooting leader looks at a monitor, and a gunner receives in label and has defined the aim, instruction about how to define collimation can be performed.

[0059] Moreover, since the shooting action itself can be simulated without using a live cartridge, there is no generating of an ammunition and which label article of consumption. Moreover, the \*\* member for the \*\* member for target bullet mark reading and watch becomes unnecessary. Moreover, for the beginner of shooting, it can get used without risk of following on live shooting to the treatment of a gun.

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**TECHNICAL PROBLEM**

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[Problem(s) to be Solved by the Invention] In shooting training by the above-mentioned conventional small arms, shooting instruction is made by seeing the bullet mark on a target etc. However, these are made after shooting to the last, and when a gunner establishes a gun, receives in label and has defined the aim, they cannot be performed.

[0005] Moreover, since shooting training by the above-mentioned conventional small arms is live shooting, cures against a \*\* member, such as a staff for watch, are required for it. Moreover, it is not avoided that an ammunition, a target, etc. exhaust, either.

[0006] The technical problem which this invention tends to solve is to enable it to carry out, when a gunner establishes a gun, instruction about how to define collimation is received in label and the aim is defined.

[0007] Moreover, other technical problems which this invention tends to solve are to substitute for a shooting action simulation shooting with which a live cartridge is not shot.

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[Translation done.]

**\*.NOTICES \***

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**MEANS**

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[Means for Solving the Problem] In order to solve the above-mentioned technical problem, the shooting training equipment of this invention shall be equipped with the monitor for gunners which displays the image photoed in the axis of a lens by the TV camera fixed to the gun in accordance with the sense of a lens, and the direction of a production of opening of a barrel almost in parallel with a barrel, and this TV camera.

[0009] In this case, it is desirable to display the graphic form which makes the central point of an image the point of aim of a gun, and shows the point of aim of a gun to the screen of the monitor for gunners. The graphic form has a good intersection also as a cross which shows the point of aim of a gun.

[0010] In order to solve other above-mentioned technical problems, for the above-mentioned means Moreover, in addition, the trigger switch which detects that the trigger of a gun was subtracted, The recognition equipment which deduces the gap with an impact area and the target currently photoed in this image shall be formed by considering that the central point of the image memorized in the image memory which memorizes the image of the camera in the time of a trigger being subtracted based on the signal from a trigger switch, and the image memory is an impact area.

[0011] In this case, it is desirable to calculate the score of that shooting based on the location gap with the impact area and target by which rate appearance was done [ above-mentioned ], and to display on the monitor for gunners.

[0012] Moreover, the shooting training system of this invention is equipped with the management equipment which connected two or more above shooting training equipments, and management equipment shall total the shooting data which consist of a location of the impact area received from two or more shooting training equipments, or a score, and shall display a total result on an administrative monitor according to a list or an individual.

[0013] In this case, it is desirable to control two or more label-destruction with which a remote-operation means is formed in management equipment, and it corresponds to two or more shooting training equipments with that remote-operation means, respectively, and appearance.

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[Translation done.]

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**OPERATION**

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[Function] According to the above-mentioned solution means, the technical problem which should solve this invention is solvable with the next operation. Namely, as for the image acquired by the TV camera fixed in parallel with a gun, all the points on the production of a barrel are located at the core of an image. Here, if a ballistic trajectory simulates with a match on the production of a barrel, by the location gap with the central point of a display image, and the target in an image, collimation can set and the propriety of the direction can be known immediately. Therefore, by seeing the monitor for gunners, while [ that ] the gunner is aiming at the target, a shooting leader can check the point of aim and target on a screen, and can perform suitable instruction.

[0015] Moreover, if graphic forms, such as a cross joint which shows the central point (point of aim) of an image, are piled up and displayed on monitor display in addition to this, a shooting leader can identify the gap with the point of aim and a target more clearly.

[0016] Moreover, in addition to the above, other technical problems which should solve this invention are solvable with the next operation. That is, the image of the moment of pulling the trigger detected with a trigger switch is fixed to an image memory. Here, if the central point of the image is simulated with an impact area on a target, an impact area is immediately illustratable on the target of monitor display by searching for a position coordinate from the gap with this and the label hit alignment in an image. Therefore, a shooting action can be simulated by these actuation of a series of, without shooting a live cartridge. Moreover, grading of the simulation shooting is automatable by computing the score of impact according to the scorebook which was able to be defined beforehand to coincidence.

[0017] Moreover, since shooting staff management can carry out monitoring of each gunner's shooting training result according to a list or an individual by using two or more above-mentioned shooting training equipments by two or more gunners, collecting the data of the training result, and carrying out a screen display with a monitor, it can be used for shooting training in a unit unit.

[0018] Moreover, in addition to the above-mentioned configuration, shooting staff management can command shooting training in the place distant from the gunner by having enabled it to operate each label-appearance and destruction by remote control.

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[Translation done.]

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## EXAMPLE

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[Example] The block diagram about [ whole ] one example of the shooting training system which applied the shooting training equipment of this invention to drawing 1 is shown. This example consists of two or more sets of shooting training equipments, and 1 set of management equipments.

[0020] The shooting training equipment 1 of this example is constituted by the trigger switch 6 fixed to TV camera 3 fixed to the gun 2, the image processing system 4, the monitor 5 for gunners, and the gun 2, the control unit 7 for gunners, and the target driving gear 8 which appears and destroys a target 43. The image from TV camera 3 is displayed on the monitor 5 for gunners through an image processing system 4. Moreover, at the moment of shooting detected by the trigger switch 6, it is told to an image processing system 4 through the control unit 7 for gunners, it considers that the point of aim within the instantaneous camera image is an impact area, and grading processing is made. As for above shooting training equipment 1, a lane is arranged by the number at the maximum for every lane in 1 set and the whole launch complex.

[0021] The remote-operation terminal 11 and the monitor 12 for shooting staff management are connected to the control unit 10 for shooting staff management, respectively, and the management equipment 9 of this example is constituted. The control unit 10 for shooting staff management also controls each target driving gear 8 connected to this according to a package or an individual while controlling each control unit 7 for gunners. Moreover, the remote-operation terminal 11 is used in order to carry out the setting input of the various conditions of each control unit 7 for gunners, or to operate each target driving gear 8 by remote control and to appear and destroy a target 43. Each gunner's shooting training result is displayed on the monitor 12 for shooting staff management according to a list or an individual. Above management equipment 9 is arranged only 1 set in the whole launch complex, and the control unit 10 for shooting staff management of management equipment 9 and the control unit 7 for gunners of each shooting training equipment 1 constitute the shooting training system from connecting mutually through a LAN circuit.

[0022] Moreover, storage, printing, and the shooting data processor 14 that carries out image display may be added for the monitor 13 for shooting staffs which displays a gunner's shooting training result according to a list or an individual like the monitor 12 for shooting staff management as this shooting training structure of a system, each gunner's shooting training result, etc. In drawing 1, although the monitor 13 for shooting staffs serves as connection only whose one set went via the LAN circuit, it is good for the control unit 10 for shooting staff management also as direct connection connection like the monitor 12 for shooting staff management. Moreover, two or more monitors 13 for shooting staffs may be connected.

[0023] The example block diagram of an image processing system 4 and the control unit 7 for gunners which is the important section of the shooting training equipment 1 of this example is shown in drawing 2. An image processing system 4 consists of a switcher 15, the display process circuit 16, video 17, an image memory 18, and recognition equipment 19, and the control device 7 for gunners consists of the impact-area memory 20, the actuation switch 21, an interface circuitry 22, an I/O circuit 23, and a control circuit 24 that controls above-mentioned each part.

[0024] The video signal from TV camera 3 is inputted into a switcher 15. With directions of a control circuit 24, a switcher 15 chooses the signal path to the display process circuit 16, video 17, and an image memory 18. In addition, with alternative, this routing may not be restricted but may choose two or more things as coincidence.

[0025] With directions of a control circuit 24, the display-processing circuit 16 processes the video signal of real time soon inputted from a switcher 15. Moreover, with reference to coincidence, the contents of the impact-area memory 20 also carry out image composition at a multi-window format, and output these to the monitor 5 for gunners. Moreover, the video signal from video 17 may be processed and it may output to the monitor 5 for gunners.

[0026] With directions of a control circuit 24, video 17 is recorded through the video signal inputted from a switcher 15, or reproduces a video signal from a medium, and outputs it to the display-processing circuit 16.

[0027] An image memory 18 memorizes the video signal for one screen inputted from a switcher 15 as a static image following directions of a control circuit 24. With directions of a control circuit 24, recognition equipment 19 recognizes

the label-image reflected in the image from the contents fixed to the image memory 18, and detects the difference of the location of the label-central point and central point of an image. And the position coordinate of an impact area is computed, it asks for the score of the impact according to the scorebook which was able to be defined beforehand, and these are accumulated in the impact-area memory 20. The contents of the impact-area memory 20 are referred to from the display-processing circuit 16 or the I/O circuit 23.

[0028] Mainly at the time of use with a shooting training equipment simple substance, the actuation switch 21 is used in order to input choose distance, target size, etc., or to shoot, to drive the target driving gear 8 and to appear and destroy a target 43, a gunner name. Moreover, it is used also for actuation of the image transcription of video 17, or playback. And the interface circuitry 22 took charge of the input interface of the actuation switch 21 and the trigger switch 6, and has told the signal from these input units to the control circuit 24. The moment of shooting is detected, and a control circuit 24 controls a switcher 15 by the trigger switch 6, and makes an image memory 18 memorize the image from TV camera 3 with it at the moment of the signal which shows it being told to a control circuit 24 through an interface circuitry 22. It is as having described previously a series of actuation of each part, such as the image memory 18 after this, recognition equipment 19, and the impact-area memory 20.

[0029] The I/O circuit 23 has an interface for LAN circuits. The control device 7 for gunners can communicate with the control device 10 for shooting staff management, or the shooting data processor 14 from connecting with a LAN circuit using this. Based on directions of a control circuit 24, the I/O circuit 23 receives the gunner data from the control signal, the control signal to the target driving gear 8, or the shooting data processor 14 to the control unit 7 for gunners from the control unit 10 for shooting staff management etc., and is \*\*\*\*\* to a control circuit 24 about these. Moreover, information, such as positional information of an impact area and a score, is acquired from the impact-area memory 20, and it transmits to the control device 10 for shooting staff management, or the shooting data processor 14 by making these into shooting data. In addition, transmission and reception of data with the shooting data processor 14 are not direct, and can also be performed via the control unit 10 for shooting staff management. Furthermore, the I/O circuit 23 has a RS232C interface. The control unit 7 for gunners can connect the target driving gear 8 using this, and a target's 43 appearance and motion control of destruction can be performed by sending a control signal to this.

[0030] The example block diagram of the control unit 10 for shooting staff management which is the important section of management equipment 9 is shown in drawing 3. The control device 10 for shooting staff management consists of the actuation switch 25, an interface circuitry 26, the I/O circuit 27, a display-processing circuit 28, and a control circuit 29. A control circuit 29 is controlling the timing of transmission and reception using the I/O circuit 27, and is also performing control of this whole system to each control unit 7 for gunners, each target driving gear 8 connected to them, and a pan while it controls above-mentioned each part in the control unit 10 for shooting staff management, respectively.

[0031] The actuation switch 25 is used in order to change the contents of a display of the monitor 12 for shooting staff management. And the interface circuitry 26 took charge of the input interface of the actuation switch 25 and the remote-operation terminal 11, and has told the signal from these input units to the control circuit 29.

[0032] The I/O circuit 27 has an interface for LAN circuits. By connecting with a LAN circuit using this, the control device 10 for shooting staff management can communicate with the control device 7 for gunners, or the shooting data processor 14. The I/O circuit 27 transmits the control signal to each control unit 7 for gunners, the control signal to the target driving gear 8 connected to these, etc. based on directions of a control circuit 29. Moreover, shooting data etc. are received from each control device 7 for gunners. Similarly, data are transmitted and received also between the shooting data processors 14.

[0033] The display-processing circuit 28 changes into a picture signal each gunner's gunner data received via the I/O circuit 27, shooting data, etc., and they carry out a display output according to an individual for each [ a list or ] gunner of every to the monitor 12 for shooting staff management with directions of a control circuit 29.

[0034] The example block diagram of the shooting data processor 14 is shown in drawing 4. The shooting data processor 14 consists of a keyboard 30, a printer 31, an interface circuitry 32, the I/O circuit 33, the display-processing circuit 34, a monitor 35, main storage 36, an auxiliary storage unit 37, and a control circuit 38 that controls above-mentioned each part.

[0035] A keyboard 30 is used in order to input gunner data, such as a gunner name and a unit name, \*\* meeting setting data, etc. Moreover, a printer 31 prints gunner data, shooting data, \*\* meeting setting data, etc. And an interface circuitry 32 takes charge of the input interface from a keyboard 30, and the output interface to a printer 31 with directions of a control circuit 38.

[0036] The I/O circuit 33 has an interface for LAN circuits. The shooting data processor 14 can communicate with the control unit 7 for gunners, or the control unit 10 for shooting staff management from connecting with a LAN circuit using this. The I/O circuit 33 transmits gunner data etc. to each control device 7 for gunners based on directions of a control circuit 38. Similarly, based on directions of a control circuit 29, the shooting data from each control device 7 for



gunners etc. are received. Similarly, data are transmitted and received also between the control devices 10 for shooting staff management. In addition, transmission and reception of data with each control device 7 for gunners are not direct, and can also be performed via the control device 10 for shooting staff management.

[0037] With directions of a control circuit 38, the display-processing circuit 34 changes into a picture signal each gunner's gunner data received via the I/O circuit 33, shooting data, etc., and outputs them to a monitor 35.

[0038] Main storage 36 stores the information on the shooting data of each control device 7 for gunners received by the information inputted by the keyboard 30 with directions of a control circuit 38, or the I/O circuit 33 etc. Moreover, main storage 36 is backed up by the floppy disk with an auxiliary storage unit 37.

[0039] Next, actuation of this example is explained.

[0040] First, preparations for use are described. In the \*\*\*\*\* 42 neighborhood, as shown in drawing 5, it shoots to the target driving gear 8 currently installed to the front, and the target 43 according to distance is attached. The target 43 according to each \*\*\*\*\* (100m, 200m, and 300m) is shown in drawing 6.

[0041] Shooting training equipment 1 is assembled in a launcher 44. That is, a gunner fixes TV camera 3 and the trigger switch 6 to a gun 2 like drawing 7. And TV camera 3 is connected to an image processing system 4, and the trigger switch 6 is connected to the control unit 7 for gunners, respectively. Moreover, the monitor 5 for gunners is connected to an image processing system 4. Furthermore, the control unit 7 for gunners and the target driving gear 8 in \*\*\*\*\* 42 this side are connected.

[0042] In performing this shooting training as a unit, management equipment 9 is needed. The monitor 12 for shooting staff management and the remote-operation terminal 11 are connected to the control unit 10 for shooting staff management, and management equipment 9 is constituted. And the control unit 10 for shooting staff management and the control unit 7 for gunners of two or more shooting training equipments 1 are connected through a LAN circuit. Moreover, the shooting data processor 14 and the monitor 13 for shooting staffs are also connectable through a LAN circuit similarly. The case where gave especially the following explanation the shooting training system by which in the case of training of the unit unit which uses two or more lanes the configuration of each equipment was also equipped with management equipment 9 unless it refused, and the shooting data processor 14 and the monitor 13 for shooting staffs are further added from this shall be described.

[0043] Next, the remote-operation terminal 11 is operated and it chooses about whether each label-appearance and destruction are performed by \*\* meeting setup, or it carries out manually. In addition, it says setting up beforehand the time amount to the label-appearance determined as a \*\* meeting setup for every number, and destruction. And while transmitting to gunner data, the existence of foot use, and the control unit 7 for the gunners of the lane in which it shoots, distance, the class of gun to be used, etc. are set, and such information of the concerned gunner is and displaying on the applicable part of each monitor 5 for gunners through an image processing system 4 for every gunner, it stores also in the shooting data processor 14 at the delivery main storage 36.

[0044] Moreover, a keyboard 30 can be used also in the shooting data processor 14, gunner data, such as a gunner name and a unit name, \*\* meeting setting data, etc. can be inputted, and these can be registered into main storage 36.

[0045] In addition, the actuation switch 21 of the control device 7 for gunners performs setup about appearance and destruction of the target 43 in the case of performing shooting training in an individual unit not on a unit unit but on an independent lane, and actuation.

[0046] Next, the actuation at the time of use is described. A gunner establishes a gun 2 so that it may come on the marker of the self-lane where the muzzle was installed in the launcher 44. The image from TV camera 3 fixed to the gun 2 is displayed on the monitor 5 for gunners which exists to a gunner through an image processing system 4. The example of a screen display of the monitor 5 for gunners is shown in drawing 8. A target's 43 image photoed by TV camera 3 with the cross line in which the point of aim of a gun is shown is displayed on the TV camera graphic display section of monitor 5 screen for gunners. A shooting leader performs fine instruction about how to define collimation by pointing out the gap with a gunner's point of aim and a label hit alignment, looking at this. Moreover, the rain number 45 is displayed on the target 43, when a shooting leader checks this with the monitor 5 for gunners, conventionally, it can be careful of it or shooting to the adjoining lane generated frequently can be prevented. The situation of the exchange of a gunner and a shooting leader in the above launcher 44 is shown in drawing 9. In addition, it can also discriminate from a gunner by processing the rain number 45 currently displayed on the target 43 with recognition equipment 19. Moreover, by operating the actuation switch 21, recording the image of TV camera 3 on videotape in video 17 can also be reproduced after this, and it can also carry out a screen display to the monitor 5 for gunners.

[0047] By a command of shooting staff management or appearance of the target 43 which operates the remote-operation terminal 11, a gunner aims at the texture \*\*\*\* target 43, and pulls a trigger. The trigger switch 6 detects the moment and notifies it to the control unit 7 for gunners. The control unit 7 for gunners controls the switcher 15 in an image processing system 4 by the control circuit 24, and makes an image memory 18 memorize the image of TV camera 3 of the moment of pulling a trigger, by it. And it considers that the point of aim of the moment of lengthening

the central point of an image, i.e., a trigger, with recognition equipment 19 is an impact area on a target, the coordinate of an impact area is searched for by measuring the gap with this point and the core of the target 43 reflected in the image, and that score is computed. And while storing such information in the impact-area memory 20, an image processing is carried out in the display-processing circuit 16, on the target currently illustrated in the impact position representation section of the monitor 5 for gunners, the position coordinate of the newest impact area is indicated by the mark, and a score and the totaling point of the impact are displayed at the score data display section. The situation is shown in drawing 8.

[0048] Moreover, the positional information of an impact area and the score which were stored in the impact-area memory 20 are transmitted timely through a LAN circuit as shooting data towards the control unit 10 for shooting staff management of management equipment 9 from the I/O circuit 23 with gunner data etc. The control device 10 for shooting staff management which received this changes each gunner's received gunner data, shooting data, etc. into a picture signal by the display-processing circuit 28, and outputs them to the monitor 12 for shooting staff management. Moreover, the same screen as the monitor 12 for shooting staff management is displayed on the monitor 13 for shooting staffs. The example of a display of the screen of the monitor 12 for shooting staff management and the monitor 13 for shooting staffs is shown in drawing 10 R> 0. Thereby, shooting staff management can know each gunner's shooting training result by seeing the monitor 12 for shooting staff management. A list indication of each gunner's score is given for every lane at the score data display section classified by gunner of the monitor 12 for shooting staff management. Moreover, shooting staff management can indicate by the mark and can make the score data display section display the score on the target which has illustrated the location of the gunner's impact area in the impact position representation section of monitor display by operating the actuation switch 25 or the remote-operation terminal 11, and choosing a specific gunner.

[0049] Moreover, suitably, these shooting training results are printed by the printer 31, or a screen display is carried out to a monitor 35 while they are sent also to the shooting data processor 14 and memorized by main storage 36. In addition, the data memorized by main storage 36 are backed up by the floppy disk with an auxiliary storage unit 37.

[0050] When a gunner receives in label and has defined the aim by the above because a shooting leader looks at the monitor 5 for gunners according to this example, instruction about how to define collimation can be performed.

[0051] Moreover, since the shooting action itself can be simulated without discharging a live cartridge, neither an ammunition nor a target needs to exhaust. And the \*\* member for the \*\* member for bullet mark reading and watch becomes unnecessary. Moreover, for the beginner of shooting, it can get used without risk of following on live shooting to the treatment of a gun.

[0052] Moreover, when performing shooting training in a unit unit, instant monitoring of each gunner's shooting training result can be performed by totaling the shooting data sent from two or more shooting training equipments of each with management equipment, and displaying according to a list or an individual with an administrative monitor.

[0053] Moreover, shooting training can be commanded in the place distant from the gunner by making the target of each lane appear and destroy at a remote-operation terminal.

[0054] It describes below about other examples using this invention.

[0055] In the shooting training equipment of this invention, practice of loading of a projectile can be performed by using a blank-shot cartridge at the time of shooting training. Training near live shooting is attained by furthermore experiencing the sound at the time of discharge, and counteraction.

[0056] Moreover, by connecting to the shooting training equipment of this invention the equipment which reads the impact area of live shooting etc., it can shoot at both the aforementioned simulation shooting and live shooting by the same gun, and deflection of the ballistic trajectory by amendment of the parallelism of a barrel and a TV camera or the wind etc. can be amended by detecting the difference of both impact area.

[0057] Furthermore, in the shooting training system of this invention, shooting training more near a battle can be performed by giving other gunners the gun of this configuration and performing simulation shooting mutually.

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[Translation done.]

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is a block diagram about [ whole ] one example of this invention.

[Drawing 2] It is the example block diagram of an image processing system 4 and the control unit 7 for gunners.

[Drawing 3] It is the example block diagram of the control unit 10 for shooting staff management.

[Drawing 4] It is the example block diagram of the shooting data processor 14.

[Drawing 5] It is a target's 43 explanatory view currently installed before \*\*\*\*\* 42.

[Drawing 6] It shoots and is the explanatory view of each target 43 according to distance.

[Drawing 7] It is the explanatory view showing the condition of having fixed TV camera 3 and the trigger switch 6 to a gun.

[Drawing 8] It is the explanatory view of the example of an image of the monitor 5 for gunners.

[Drawing 9] It is the explanatory view showing the pattern of shooting in a launcher 44.

[Drawing 10] It is the explanatory view of the example of an image of the monitor 12 for shooting staff management, and the monitor 13 for shooting staffs.

[Drawing 11] It is the explanatory view of launch complex 40 used for shooting training or a shooting game.

[Description of Notations]

1 Shooting Training Equipment

2 Gun

3 TV Camera

4 Image Processing System

5 Monitor for Gunners

6 Trigger Switch

7 Control Unit for Gunners

8 Target Driving Gear

9 Management Equipment

10 Control Unit for Shooting Staff Management

11 Remote-Operation Terminal

12 Monitor for Shooting Staff Management

13 Monitor for Shooting Staffs

14 Shooting Data Processor

18 Image Memory

19 Recognition Equipment

20 Impact-Area Memory

43 Target

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[Translation done.]

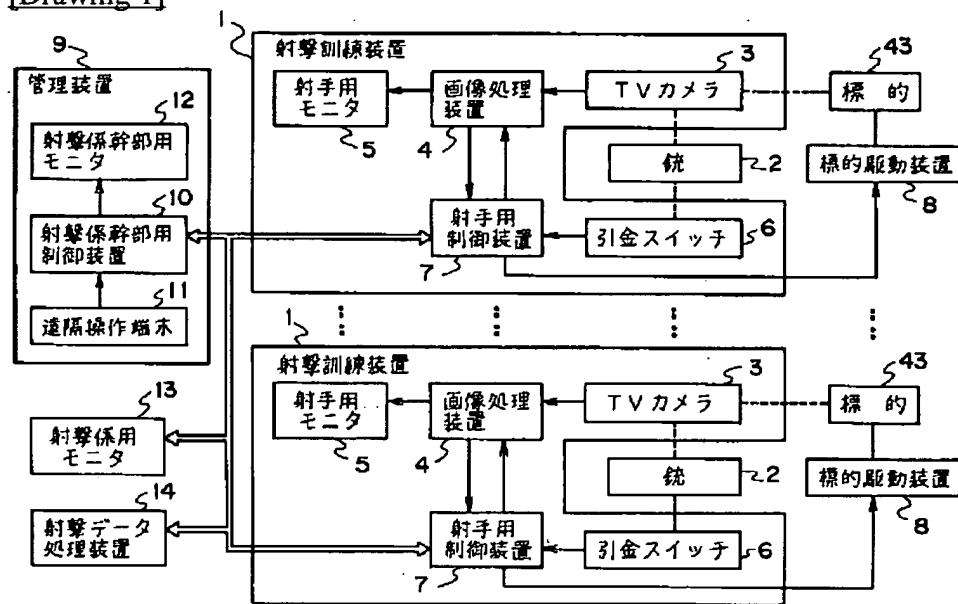
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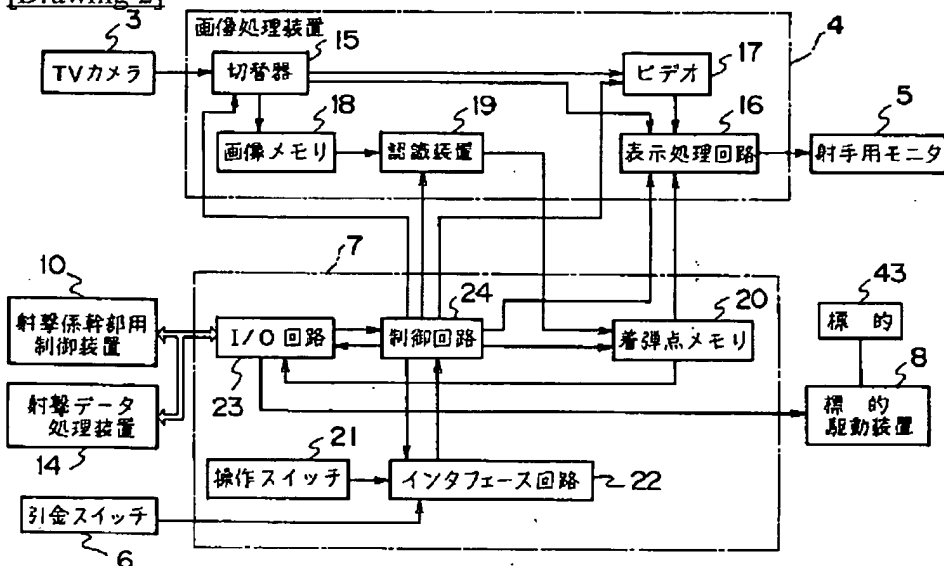
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DRAWINGS

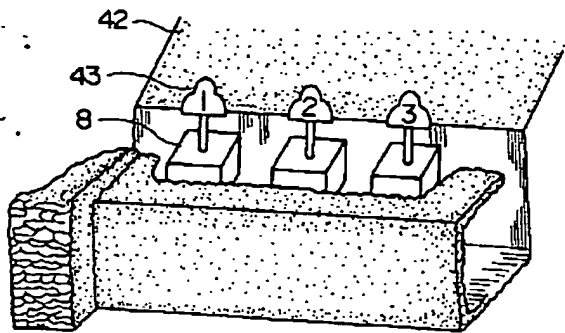
[Drawing 1]



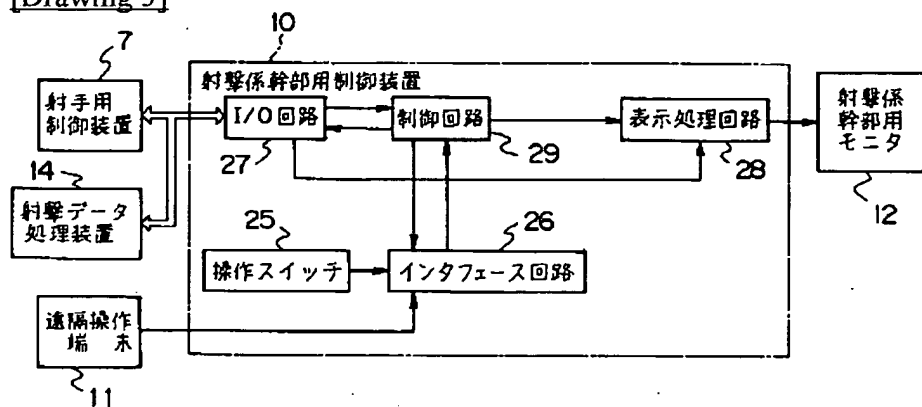
[Drawing 2]



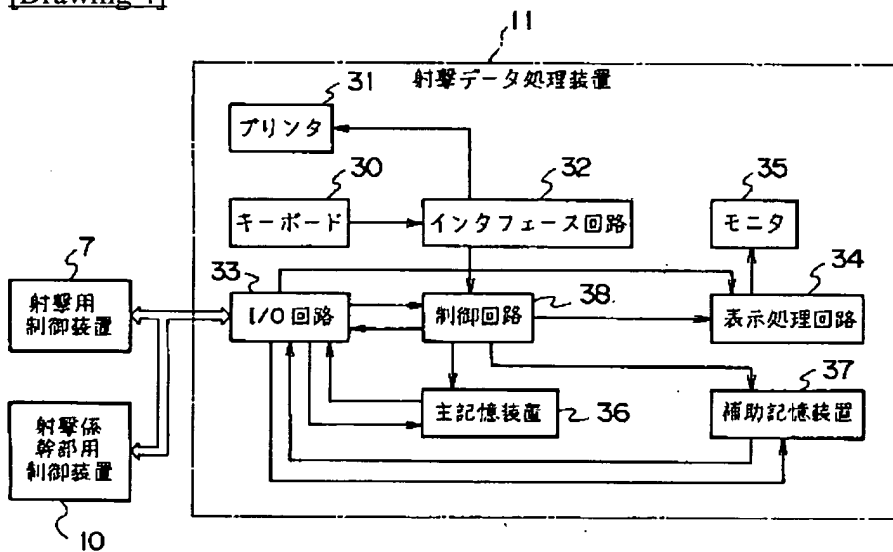
[Drawing 5]



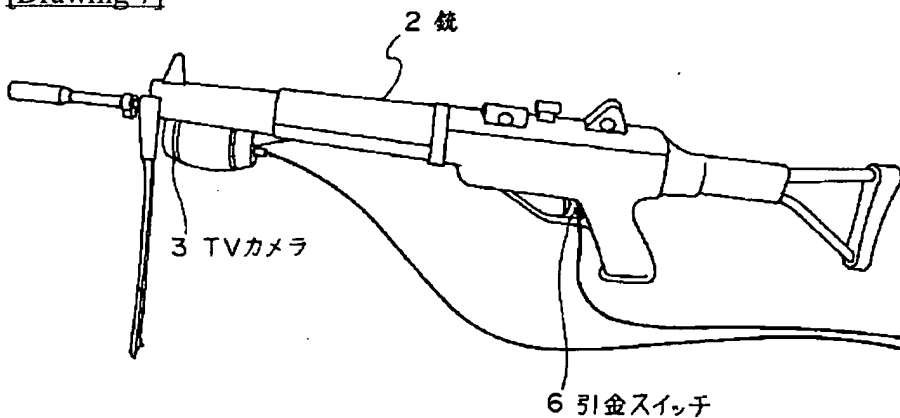
[Drawing 3]



[Drawing 4]



[Drawing 7]

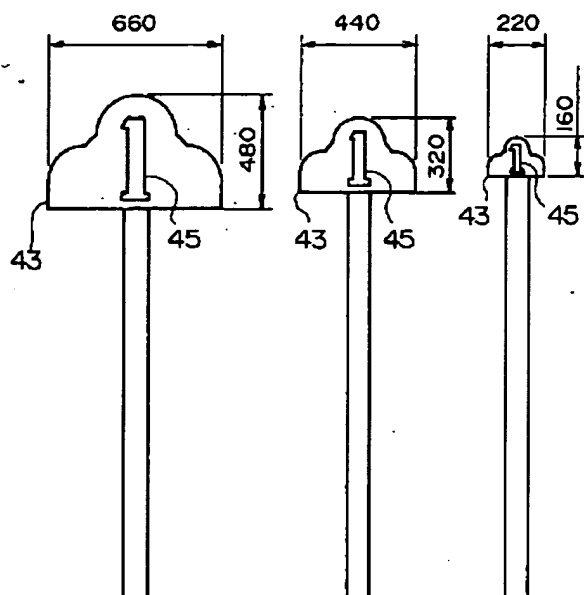


[Drawing 6]

300m用標的

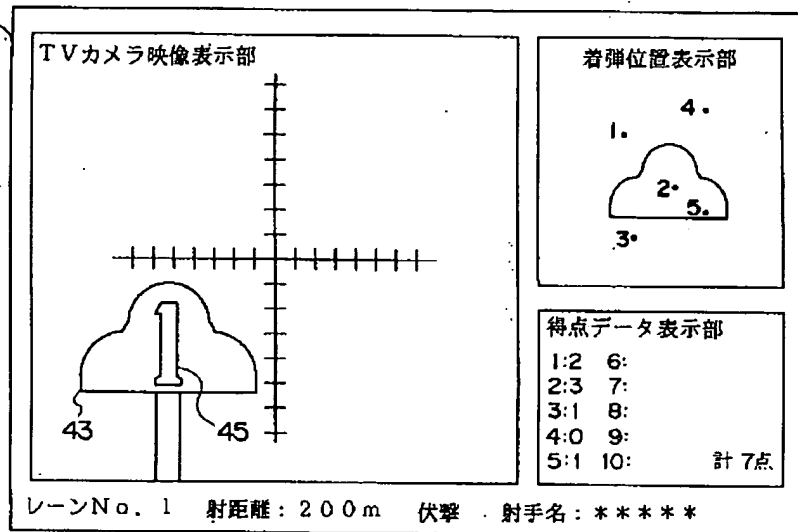
200m用標的

100m用標的

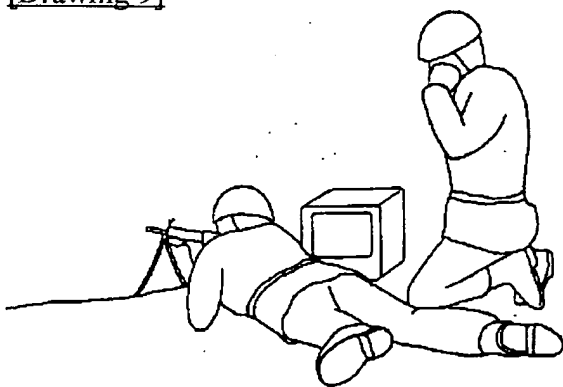


[Drawing 8]

5 (射手用モニター画面)

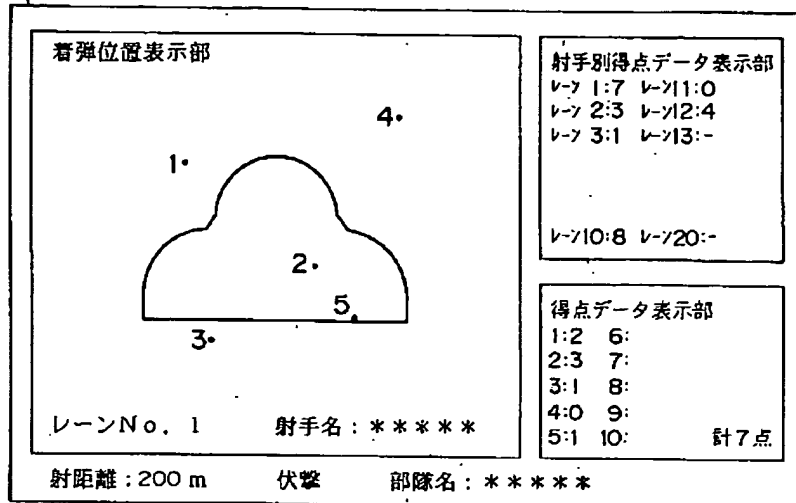


[Drawing 9]

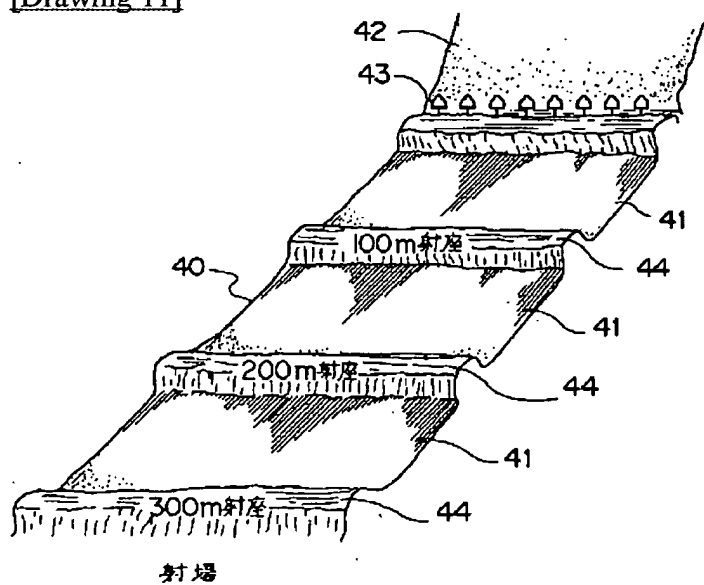


[Drawing 10]

12,13  
 : (射撃係幹部用、射撃係用モニタ画面)



[Drawing 11]



[Translation done.]